

Chapter 5 Monitoring

The following represents an integration of ideas from many sources for a long-term monitoring program. The array of items is not necessarily exhaustive nor complete and will change over time. It is not particular to any one alternative. As with plan implementation, this subject is informational in nature and is not a proposed decision. There are many reasons for this, two of which are that 1) agencies cannot make land use decisions which carry fiscal commitments beyond the current budget year and 2) priorities are subject to change. However, identified monitoring does generally reflect implementation responsibilities and priorities and is extremely vital to long-term management.

The subject presents a conundrum: it is essential that monitoring occur so that plans and management can adapt to new information and changing landscapes. Monitoring:

- is expensive and often not implemented in land management due to budget constraint
- if not accomplished risks species and habitat losses and future, more difficult use restrictions and species listings under state and federal endangered species acts
- will compete with similar needs in other areas with greater resource issues
- if not implemented for listed species risks a USFWS jeopardy opinion on the Plan

In spite of these issues an ambitious strategy for monitoring is presented below.

Purpose

There are two elements to this chapter:

- define the conceptual framework for monitoring - nature and scope
- define what is to be monitored - array and priorities

Why monitor?

Perhaps the main purpose of monitoring is to maintain the pulse of ecosystem health:

1. Early Warning. To detect early signs of ecosystem change, to assess ecosystem health and trend, to determine if the specific and arrayed decisions that we have been are correct and effective given defined goals for ecosystem health. This is the essence of the NPS “Vital Signs” and BLM’s Standards for Rangeland Health programs.
2. Compliance. To determine if management programs are meeting specific, issue-driven requirements of such matters as difficult plan decisions, endangered species acts, and biological opinions.
3. Diagnosis. To assess the results of a specific management decision/use authorization to determine if the authorization is being conducted in the manner prescribed or anticipated. This may include such activities as moving cattle from one part of a lease to another, a footprint of disturbance for a pipeline, level of use on a route of travel, and disturbance rehabilitation.

Scope for NECO

Under the general heading of “monitoring” information gathering is expanded to include:

- Monitoring ecosystem health (noted above)
- Resource inventory/New information. The collection of additional or new data to improve the data bases and models upon which the plan and management are based. Most species and habitat decisions are based in models: predictive occurrence and species-habitat values. For some species in some areas it may be necessary over time that we rely less on models and more on known data.
- Research. This is similar to monitoring in terms of application of scientific method.

- Monitoring tells us “what” is occurring; research explains “why”.
- Occurrence and nature of uses. This includes collecting information (nature and location) on casual and authorized uses such as driving on roads and in washes, cattle operations, and mining and rights-of-way. Information is used to update the assessment of the reasonable foreseeable future and can better direct and interpret monitoring and research tasks.

Tracking of other plan implementation tasks (e.g., tortoise fencing, land acquisitions) is not included as monitoring but is included in the implementation plan section.

One-time, Continuous, Sequential actions and Priorities

Additional general considerations include:

- some monitoring and research may be sequential - i.e., initial monitoring efforts may lead to subsequent efforts. The results from early/initial efforts may suggest either no additional monitoring is needed or subsequent effort is needed. In other words not all efforts can be foreseen and some efforts may be a waste of time and funding because it might turn out that they are not needed. So, subsequent steps from an initial monitoring action may lead to continuation or new monitoring, to research, or to adaptive management.
- some tasks are continuous, at least for a very long time - e.g., use authorizations, desert tortoise and bighorn sheep populations trends.
- not all tasks can be funded at one time and require prioritization; all will be grouped into 3 priority bands: Continuous, High (near-term), and Low (long-term)
- some low priority tasks may never be accomplished because it may turn out that they are not needed or that they never become a high enough priority.
- inventories to improve data bases will tend to be lower priority than monitoring. To expand on this, in NECO much of the basis for decisions is models of the relationship of species and habitats and levels of use. Given the relatively low level of uses in the NECO planning area, we assume the models are sufficient in sophistication and quality to serve well. In the future, if changing use levels occur and/or monitoring suggests that species are in decline, a higher emphasis on inventories may be necessary.
- few research needs are identified at this time. More will come to light as monitoring results are evaluated.

Long list v Short list

Monitoring is expensive. “Enough funding” never happens, so one can argue that a monitoring program should be conservative (a short list) to avoid set up to fail. In spite of this we are proposing a long, broad list of tasks for the following reasons:

- Given the (new) cooperative nature of the plan, there are a number of agencies and non-agency interest groups that together offer greater capability and variety of funding mechanisms than with single-agency planning in the past. Each brings similar and different interests which together covers a wide variety of topics.
- Grant funding offers greater opportunities than in the past.
- Management and monitoring are a long-term continuum. If it takes 100 years to accomplish the monitoring tasks, so be it.
- A list will be annually reviewed and prioritized.

Local v. Regional Considerations, Assignments, and Expertise

The roles of NECO cooperators, the Desert Managers Group, USGS BRD, academia, and interest groups such as the California Native Plant Society and Desert Wildlife Unlimited expand cooperative opportunities

but this many entities performing monitoring can also create confusion and conflict that must be managed.

- NECO Cooperators will attempt to develop a clear and complete a list of monitoring and related needs with the above discussion in mind and annually seek funding and grants to accomplish it. Within the NECO group agreements will have to be reached to divide the work. NECO managers will meet on a regular basis to do discuss, review progress, and update commitments. NECO cooperators will attempt to accomplish as much as it can, but help may be sought from the following groups.
- Desert Managers Group (DMG) will develop its monitoring and research efforts with a regional perspective. Concerns that the NECO cooperators may have about funding, methodologies, and other matters may also be advanced to the DMG for help and lead. The DMG can serve as a positive force for technical expertise, funding, and priorities setting.
- USGS-BRD and academic institutions can make significant contributions through research and expertise such as advising on methodologies. USGS-BRD is the official Department of Interior research body and should contribute significantly to NECO research needs. University of California, Riverside Center for Conservation Biology and the Desert Studies Consortium should be encouraged to direct projects and research of students and from interest around the world to desert needs.
- Plan-plan coordination is a concern. Cooperators for each major planning effort, with help from the DMG, should assure consistency among plans for tasks, common resource values, priorities, methodologies, etc.

Scientific method

With the importance placed on this subject, new information that is developed from monitoring, inventories, and research must pass a test of confidence - basically must conform to the scientific method - prior to being added to data bases.

1. For monitoring, new inventories, and research, this will/may include:
 - literature review
 - concurrence on design, statistics, conclusions
 - methods are verifiable and repeatable
2. For statistics and trends on uses, this will/may include:
 - same criteria as above, except
 - information sources may not involve field work as much as gathering of statistics and mapped information in agency records and files

Monitoring Tables and Specific Programs

The following set of tables display an array of needed/suggested work by habitat, species or species group. Each is further defined by priority and task category: monitoring (M), resource inventory (I), research (R).

| <u>Table #</u> | <u>Topic</u> |
|----------------|--|
| 5-1 | General Monitoring of Ecosystem Health |
| 5-2 | Desert Tortoise |
| 5-3 | Bighorn Sheep and Mule Deer |
| 5-4 | Other Special Status Species |
| 5-5 | Burros |
| 5-6 | Occurrence of Uses - DWMA's |

5-7 Occurrence of Uses - WHMAs
5-8 Habitat-Species specific

From the many items which appear on the tables which follow, a few emerge as the top priorities:

- Alien plants: distribution, trend, causes of spread
- Desert Tortoise: populations and trends
- Desert Tortoise: disease and other causes of populations decline
- Desert Tortoise (also Bighorn Sheep, other Special Status Species, adjacent habitat): effects of artificial waters
- Desert Tortoise and Bighorn Sheep: cattle operations and implementation of Guidelines
- Coachella Valley milkvetch: known populations
- Bighorn Sheep: populations and trends, deme demographics
- Bighorn Sheep, Habitat: habitat trend in/out burro herd management areas
- Some (rare/most sensitive) other Special Status Species: populations and trends
- Habitats (general): restoration technology and management
- Burros: occurrence and population levels
- Springs and Seeps: water production trends, tamarisk invasion
- Uses: vehicle use in washes, tracking various authorized uses

Research Natural Areas (RNAs)

It is BLM policy that RNAs be created to provide for non-manipulative baseline research on representative areas of relatively unaltered ecosystems. The basis for designation is plant communities as recognized in *A Manual of California Vegetation* (Sawyer and Keeler-Wolf 1995). Achieving representation of all plant communities throughout California is a long-term, multi-agency goal that may take years to accomplish. RNAs are not uncommon to state and federal agencies.

The premise behind the policy is that many plant communities are actively managed in a disturbed condition but it is impossible to scientifically manage them as such without baseline information and control areas. RNAs would provide the baseline/control. RNAs would not necessarily serve all research needs nor would all research be specifically assigned to RNAs. They can greatly help to attract relevant research to the desert.

Because of the complexity of plant communities and management issues involved with establishing RNAs, it makes sense to establish a set for the California Desert at one time so that they best capture the spread of plant communities, and needs/issues of all agencies. Establishing a set of RNAs was an action consideration in this planning process, but it is now deferred to a desert-wide initiative.

Table 5-1 Monitoring for General Ecosystem Health

| Type/Priority | Question to Answer | Task Name | Agency/Interest |
|---------------|--|------------------------|-----------------|
| M/Continuous | Are Standards being met? See Section 2.1 on Standards & Guidelines and indicators. See next set of tables for specific species needs. | Set and read transects | BLM, NPS, USMC |
| M/Continuous | What is the trend in human disturbance by plant community? | | BLM, NPS, USMC |
| R/High | Alien plants. What is the trend in occurrence by plant community? How are their distribution affected by air pollutants, use of routes of travel and washes, and fire occurrence? To what extent are they displacing native species? | | USGS, CNPS |

Table 5-2 Monitoring for Desert Tortoise

| Type/Priority | Topic and question to Answer | Task Name | Agency/Interest |
|---------------|--|---|-----------------|
| M/Continuous | What is the population trend? | Line-distance monitoring | BLM, NPS, USMC |
| M/Low | Population. What is the trend in population demographics? | Permanent study plots | BLM, NPS, USMC |
| M/Low | Ravens. What is the trend in raven population and tortoise predation by ravens? | Ravens monitoring | BLM, NPS, USMC |
| I/Low | Tortoise numbers. What is the current distribution and numbers for populations given recent years of decline? | Re-inventory desert tortoise | BLM, NPS, USMC |
| R/High | Disease. What do we need to know about tortoise diseases that can help in land management? | Epidemiology of upper respiratory tract and shell diseases in wild populations. Relationship between environmental toxicants and tortoise health | USGS |
| R/High | If populations are not increasing as should, what is/are the cause(s)? | Validate line-distance-sampling technique. | USGS |
| R/Low | Where the occurrence of chronic unauthorized use is deemed to be significant (e.g., a high amount over a large area) what is the nature of tortoise mortality? | Demography and mortality in tortoise populations. Effects of illegal alien travel, OHV uses, Border Patrol interdiction activities (mostly relates to Eastern Colorado Desert Recovery Unit) | USGS |

| Type/Priority | Topic and question to Answer | Task Name | Agency/Interest |
|---------------|--|---|-----------------|
| R/Low | Recolonization. What is the trend of habitat and tortoise recolonization in areas adjacent to highway fencing? | Effectiveness of barrier fences and culverts in recovery of local populations. | USGS |
| R/High | Alien plants/Wildland fire. How do occurrence and trend in alien plants and wildland fires influence populations? | Ecological relationship between wildland fires and alien plant invasion and tortoise distribution | USGS |
| R/Low | How do various land uses and predation effect tortoise populations? e.g., | Vehicle use on approved routes of travel, in washes (mainly in Eastern Colorado Desert Recovery Unit) | USGS |
| R/Low | | Effects of cattle grazing on desert tortoise populations in Northern Colorado Desert Recovery Unit. | |
| R/Low | | Ecology of raven predation on desert tortoises | |
| R/Low | | To various land uses: general, physiology, and reproductive behavior. | |
| | | Animal guzzlers: direct (entrapment) and indirect (predator dynamics). | |
| M/High | | Animal guzzlers: habitat degradation | |
| R/Low | Other | Geographic variation and environmental determinants of reproduction. | USGS |
| | | Ecology of hatchling and juvenile desert tortoises | |
| | | Population response to habitat restoration (including from fires and mechanical disturbance). | |
| R/Low | Population Trend. Can population trend be correlated to areas of low or high use - public lands, private lands, cattle, burros? To weather, forage change from weeds, disease, barriers, seasonal weather? | Various research projects involved | USGS |

Table 5-3 Monitoring for Bighorn Sheep and Desert Mule Deer

| Type/Priority | Topic and question to Answer | Task Name | Agency/Interest |
|---------------|---|---------------|----------------------|
| M/Continuous | Population. What is the trend in population for each metapopulation? | Annual counts | CDFG |
| M/Low | Deaths. Which deaths are natural, unnatural? | | CDFG |
| M/High | Demographics. What is the population demographics by deme and metapopulation? | | CDFG |
| | Guzzlers. What is the relative sheep use? How well do drinkers fill and provide water? How well do they function re vandalism and natural catastrophes? | | CDFG |
| | Forage. What is the utilization? | | CDFG, BLM, NPS, USMC |
| | Deme augmentation/reestablishment. What are the results of either action? | | CDFG |
| | Deer hunting. What was the take for the previous season? | | CDFG |
| Low | Cattle. Is cattle grazing in bighorn sheep range creating significant negative affects for bighorn sheep - disease, forage, water? | | CDFG |
| (if occurs) | Domestic Sheep. Is the proximity of domestic and native sheep causing a decline in native sheep? | | CDFG, BLM |
| Low | Forage and water. What is the relationship of forage utilization and water distribution? | | CDFG |

Table 5-4 Monitoring for Other Special Status Species

| Type/Priority | Topic and question to Answer | Task Name | Agency/Interest |
|---------------|---|-----------|----------------------------|
| M/High-Low | Population trend. What is the population trend for the special status species? Monitoring priority may be commensurate with sensitivity, abundance, gap analysis, threats, etc. | | CDFG, BLM, NPS, USMC, CNPS |
| I/Low | Accuracy/confidence of predictive occurrence models. Can models be assessed for accuracy? | | USGS, CDFG |

| Type/Priority | Topic and question to Answer | Task Name | Agency/Interest |
|---------------|--|-----------|----------------------------------|
| I/Low | Vegetation map. Can this coverage be improved - i.e., capture variation in scale, latitude, elevation, rainfall pattern, other? | | USGS, CDFG, BLM, NPS, USMC, CNPS |
| I/High-Low | Known occurrence of species. Can the ranges of special status species be determined directly through field investigation and reduce or eliminate the reliance upon models? Inventories may not be equally applied depending upon sensitivity, current abundance, gap analysis, threats, etc. | | USGS, CDFG, BLM, NPS, USMC, CNPS |
| I/Low | Habitat value/predictive occurrence. Can habitat descriptions and values be further defined - e.g., functions (watering, mating, rearing young, seasonal), human use, cattle/burro use, ecological process functions, and species abundance - and better improve models of predictive occurrence, function, value? | | USGS, CDFG |
| I/Low | Life histories. Can life histories be improved? | | USGS, CDFG |
| I/Low | Physical data. Can a soils, rainfall, etc. maps be developed and be used to update models? | | USGS |
| I/High | Restoration. What best restoration practices can be applied for rehabilitation of disturbed sites? | | USGS, CDFG |
| R/Low | Trend explanation-miscellaneous. Can the trend be correlated to areas of low or high use - public lands, private lands, cattle, burros, disease, guzzlers, habitat change (weeds), climate-weather cycles? | | USGS, CDFG |
| R/Low | Ecological processes. Does analysis of data suggest disruption of ecological processes? | | USGS, CDFG |
| R/Low | Trend explanation-patch size. Does analysis of data suggest basis in patch patterns and sizes? | | USGS, CDFG |
| R/Low | Patch size. How does biodiversity vary with patch size? | | USGS, CDFG |
| R/Low | Predictive occurrence of rare plants. What are the habitat parameters for predictive occurrence for some rare plants? | | USGS, CDFG, CNPS |

Table 5-5 Monitoring for Burros

| Type/Priority | Topic and question to Answer | Task Name | Agency/Interest |
|---------------|--|-----------|----------------------------------|
| M/High | Census. What is the census for each herd? | | BLM (Colorado River cooperators) |
| M/High | Use occurrence. Where are burros using habitat in/out of HMA? Burros. Is there chronic, significant burro drift into DWMAs, other non-HMA areas? | | BLM (Colorado River cooperators) |
| M/High | Forage utilization. What is the forage utilization in their range of occurrence? | | BLM (Colorado River cooperators) |
| M/Low | Disturbance. Is burro use disturbing cultural sites (trails, dusting areas), management facilities, on private lands? | | BLM (Colorado River cooperators) |
| R/Low | Competition. Is there a burros-bighorn sheep/deer nexus regarding trends, forage/water utilization? | | CDFG/BLM |

Table 5-6 Continuous Monitoring of Use Occurrence - DWMA (by DWMA)

| Question to Answer | Agency/Interest |
|---|-----------------|
| Disturbance. What is the cumulative disturbance by authorized/unauthorized use by DWMA, adjusted for completed restoration? | BLM, NPS, USMC |
| Restoration. What is the progress on/completion of restoration of disturbed areas? | BLM, NPS, USMC |
| Private land use. What is the trend in development of private lands? | BLM |
| Unauthorized disturbance. What is the trend (location, nature) of chronic unauthorized disturbance? | BLM, NPS, USMC |
| Vehicle use. What is the relative use by vehicles of roads and washes, further defined by area, time of year? | BLM, NPS, USMC |
| Wildland fires. What was the fire history for previous years? What is the trend in fire history? Has guidance on fire suppression been followed? Are available suppression resources/response times adequate? | BLM, NPS, USMC |
| Cattle grazing. What number of cattle were present during previous grazing year? How is the lease operation being managed - i.e., cattle # by pasture by time of year? Is the operation in compliance with Guidelines and DWMA requirements? What was the forage production in the DWMA portion of the lease? | BLM |
| LTA. What private/SLC lands were acquired in the last year? What are the priorities for the next year? | BLM, NPS |
| Plan amendments. Were any amendments proposed/approved which affected DWMA's? | BLM, NPS, USMC |
| Highway fencing. What is the installation progress? | BLM, CalTrans |

Table 5-7 Continuous Monitoring of Use Occurrence - WHMA's

| Question to Answer | Agency/Interest |
|--|-----------------|
| What is the vehicle use of roads and washes in WHMA's - by area, time of year? | |
| Unauthorized disturbance. What is the trend (location, nature) of chronic unauthorized disturbance in WHMA's? | BLM, NPS, USMC |
| LTA. What private/SLC lands were acquired in the last year? What are the priorities for the next year? | |
| Cattle grazing. What number of cattle were present during the previous year by lease? How is the lease operation being managed - e.g., cattle # by pasture by time of year? Is the operation in compliance with Guidelines? What was the forage production in the non-DWMA portion of the lease? Where are cattle and bighorn sheep co-habiting? | |
| Authorized uses. What disturbance-creating uses over 100 acres were authorized in WHMA's in the last year? What is the cumulative total? With GIS calculate by habitat and species ranges. | |
| Domestic Sheep. Was grazing authorized in the past year? What parts of the lease were utilized? (More details - see grazing lease file) | |

Table 5-8 Habitat-Species specific monitoring, resource inventory, research needs.

| Species/Habitats | M | I | R | Notes |
|-----------------------------|------|-----|------|---|
| Habitats | | | | |
| Springs/Wetlands | High | Low | Low | What is water/habitat quality in areas of cattle/burro/bighorn sheep use? What is the capacity of tanks and production history of springs? |
| Desert Dry Wash Woodland | High | | High | How does habitat vary naturally and from uses? What effects are uses having on tortoise, birds, plant growth, movement of water and sand? |
| Dunes | Low | Low | | What is the sand source, sand corridor for dunes? To what degree do alien plants occur? What effects are suggested? |
| Playas | Low | Low | | What are the sources for water and soil into playas? Does brine mining create negative effects on species and habitats? |
| Chenopod Scrub | | | | |
| Sonoran Creosote Scrub | | | | |
| Mojave Creosote Scrub | | | | |
| Pinyon Pine Woodland | | | | Amount/utilization by cattle grazing. Fire effects |
| Wildlife - mammals | | | | |
| Bighorn Sheep | | | High | What are current needs and the opportunity/requirements to expand bighorn sheep between I-10 and Highway 62? |
| Mule deer | | | | |
| CA leaf-nosed bat | | | | What is the foraging range from hibernacula? What special habitat characteristics are required? |
| Occult little brown bat | | | | Where are populations being displaced from uses/vandalism? What populations are in most need of monitoring? |
| Cave myotis | | | | Which colonies are in mine shafts? Are these visited more/more vulnerable than natural caves/cavities? |
| Fringed myotis | | | | |

| Species/Habitats | M | I | R | Notes |
|--------------------------|---|---|---|--|
| Pallid bat | | | | |
| Townsend's big-eared bat | | | | |
| Pocketed free-tailed bat | | | | |
| Western mastiff bat | | | | |
| Mountain lion | | | | |
| Colorado Valley woodrat | | | | What are the distribution, core populations, and population corridors? |
| Wildlife - birds | | | | |
| Golden eagle | | | | |
| Mountain plover | | | | |
| Ferruginous hawk | | | | |
| Prairie falcon | | | | |
| Elf owl | | | | |
| Burrowing owl | | | | |
| Gila woodpecker | | | | To the extent that species occur, are starlings impacting populations? |
| Vermilion flycatcher | | | | |
| Bendire's thrasher | | | | Are isolated populations breeding? What affects breeding? |
| Crissal thrasher | | | | What is the distribution and size of populations? |
| LeConte's thrasher | | | | |
| Yellow warbler | | | | |

| Species/Habitats | M | I | R | Notes |
|---------------------------------------|---|------|---|--|
| Wildlife - reptiles/amphibians | | | | |
| Chuckwalla | | | | Is the species declining in collecting areas? |
| Colorado Desert fringe-toed lizard | | | | |
| Mojave fringe-toed lizard | | | | |
| Flat-tailed horned lizard | | | | |
| Desert rosy boa | | | | Is the species declining in collecting areas? |
| Couch's spadefoot toad | | High | | Where are there more occurrences? Does the use of washes by vehicles affect occurrence? |
| Plants | | | | |
| Angel trumpet | | | | |
| Coachella Valley milkvetch | | | | |
| Borrogo milkvetch | | | | |
| Harwood's rattleweed | | | | |
| Red grama | | | | |
| Fairyduster | | | | |
| Saguaro | | | | |
| Crucifixion thorn | | | | |
| Los Animas colubrina | | | | |

| Species/Habitats | M | I | R | Notes |
|----------------------------|---|---|---|-------|
| Spiny abrojo | | | | |
| Wiggins' croton | | | | |
| Winged cryptantha | | | | |
| California ditaxis | | | | |
| Glandular ditaxis | | | | |
| Howe's hedgehog cactus | | | | |
| Foxtail cactus | | | | |
| Crown-of-thorns | | | | |
| Spearleaf | | | | |
| Robinson's monardella | | | | |
| Munz' cholla | | | | |
| Wiggins' cholla | | | | |
| Giant Spanish-needle | | | | |
| White-margined beardtongue | | | | |
| Sand foot | | | | |
| Arizona pholistoma | | | | |
| Lobed ground cherry | | | | |
| Desert unicorn plant | | | | |
| Orocopia sage | | | | |

| Species/Habitats | M | I | R | Notes |
|---------------------|---|---|---|-------|
| Coues' cassia | | | | |
| Mesquite nest straw | | | | |
| Jackass clover | | | | |
| Mecca-aster | | | | |